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Does Inflation Targeting Matter for Economic Growth During Global Financial Crises? Evidence from Emerging Economies

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Evidence from Emerging Economies

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Abstract:

This paper examines the effects of inflation targeting (IT) on output income per capita growth in emerging economies over the period 1990 - 2014, which includes key globalization years and accounts for two of the biggest global financial and economic crises in recent history: the Asian Financial Crisis (1997-99) and the Global Financial Crisis (2007-08). I break down my sample into five geographical regions (the World, Asia, Latin America, Europe and Emerging Market Economies) to account for the regional effects of IT on growth as indicated in previous literature. I employ Fixed-Effects and Random-Effects Models that control for traditional growth determinants, globalization and periods of global financial and economic crises. I find that inflation targeting during periods of global crises on the World level, especially in Asia, result in higher output income per capita for emerging economies. Inflation targeting in general is found to be detrimental to economic growth for all regions considered. I argue that policy makers advocate for the adoption of inflation targeting regimes in developing Asian economies in order to increasing their resilience with regard to economic growth when faced with global economic and financial crises.

1. Introduction:

The aim of this study is to examine the relationship between inflation targeting and economic growth in developing countries in periods of global economic downturns based on regional breakdowns. Specifically, did inflation targeting economies perform better in terms of real output per capita growth during periods of global crises between 1991 - 2014 than did non-inflation targeting economies? This study has important policy implications for individual Central Banks and international monetary institutions like IMF, the World Bank, the European Central Bank, and even for regional blocs such as the European Union (EU) or the ASEAN. All of the abovementioned entities may be able to judge whether the regional economic growth might be achieved and sustained during periods of global financial and economic crises using an inflation targeting regime and advise individual countries and regions accordingly by better understanding the differences in the growth effects of inflation targeting regimes during times of international economic crises across different regions.

Previous literature indicates no consensus as to whether inflation targeting is an effective strategy for improving economic growth in addition to achieving price stability in a given economy. Generally, IT has been shown to be a more successful policy in developed countries, that is now being rapidly adopted by central banks in emerging economies. Additionally, studies indicate that inflation targeting countries may have performed better in terms of output growth during the Global Financial crisis of 2007-08 and the following recession, than did non-IT countries in periods both before, during and after the crisis.

The purpose of this paper is to determine the impact that IT has on growth in periods of global financial and economic crisis in a large sample of developing countries, with individual analyses for regional breakdowns. I divide my sample into five regions (World, Asia, Latin America,

Europe and Emerging Market Economies) and use Random and Fixed Effects OLS Models to determine the impact of inflation targeting on economic growth during periods of global crisis between 1991 and 2014.

The contributions of this work are the addition of the 'Global Crises', i.e. the Global Financial Crisis and the Asian Financial Crisis, as controls to this analysis, in addition to the evaluation of IT's growth effects during periods of such global crises. I introduce an interaction term between the IT and Global Crisis controls in my study in order to determine the impact of IT on economic growth during such global economic downturns.

I find that inflation targeting increases real output growth during periods of global crises on the World level, and especially in the Asia region for emerging economies. In general, inflation targeting is found to have a negative impact on growth for all the regions examined, significantly Latin America. Lastly, economic growth in the Emerging Market Economies group stems from not inflation targeting, but from increasing trade openness and exchange rate appreciation. Thus, increased globalization through trade openness leads to higher output per capita growth in Emerging Market Economies.

The rest of this paper is organized in the following manner: Section 2 reviews previous literature on this topic, Section 3 explores the analytical frame work for the study including the data and variables and empirical methodology, Section 4 discusses the results and limitations, and Section 5 concludes the paper with policy implications and future areas of study.

2. Literature Review

2.1. An introduction to Inflation Targeting:

Mishkin (2004, 2008) defines inflation targeting (IT) as a monetary policy mechanism that encompasses five main elements. Each inflation targeting Central Bank aims to implement these five main elements through its monetary policy. First, it publicly announces a medium-term numerical target for inflation. Second, it makes an institutional commitment to price stability as the primary goal of monetary policy to which all other goals are subordinate. Third, it adopts an information inclusive strategy in which many variables are used to decide the setting of policy instruments. Fourth, it increases the transparency of monetary policy through clear communication with the public and markets about its plans, objectives and the decisions of monetary authorities. Fifth, it aims to increase its own accountability in reaching its inflation objectives. Since there are lags in monetary policy to take an effect in any economy, Svensson (2009) states that an effective inflation targeting strategy must monitor and rely on the predictions or expectations on inflation and the real economy to meet its set medium term inflation goals. Brito and Bystedt (2006) state that the IT model consists of two factors: the Philips curve, that relates inflation with the economic cycle and inflation shocks, and the second is the choice made by monetary authorities between GDP and variation in inflation. If a Central bank chooses a stable GDP as the objective, it will be exposed to higher variations in inflation than in GDP. This is as opposed to a central bank that prioritizes inflation over GDP. Widely used in practice by many Central Banks around the world, the Taylor Rule specifies how a Central Bank can deal with inflation and with the level of economic activity in order to efficiently reduce inflation and GDP fluctuations to meet its set objectives.

Before the adoption of IT, central banks used monetary targets to control inflation, but eventually, many countries changed their regime to a system of IT. This was mainly because of the unstable demand for money, as it was thought that IT results in less volatile and persistent

inflation than monetary targets (Brito and Bystedt, 2006). Inflation Targeting was first adopted by New Zealand in 1990 and was followed by Canada in 1991 and England in 1992. Today, there are approximately 28 inflation targeting countries in the world (Ayres et al., 2014). Of these 28, the group of inflation targeting developed countries is heterogeneous, and the level of economic development varies drastically from one country to the next. On the other hand, the group of developing inflation targeting counties vary in the economic practices they use and their level of institutional development. However, inflation targeting is not without critics (Ayres et al., 2013). It has been argued that inflation targeting has several disadvantages including the following: (1) decreased discretion by the central bank that leads to declines in output growth, (2) too much discretion that results in the inability to influence inflation expectations, (3) higher exchange rate volatility as inflation targeting ignores exchange rate levels, and (4) inability of inflation targeting to be successful in countries that do not meet strict preconditions.

Today, all of the countries using an inflation targeting strategy use a 'flexible' inflation targeting model. Flexible inflation targeting (FIT) aims at stabilizing *both* inflation and the real economy. This is in contrast to strict inflation targeting, where the Central Bank announces hard targets for inflation and aims to stabilize only inflation (Ozturk et al., 2014). According to Svensson (2007), all inflation targeting Central Banks in the world aim to not only stabilize inflation around a target range, but also aim to stabilize the real economy. This implies that all IT countries in the world use flexible inflation targeting, making it even more important to analyze the relationship between inflation targeting and economic growth, measured in real terms.

2.2. Inflation Targeting and Economic Growth in Emerging Economies:

There is no clear consensus on the overall impact of an inflation targeting (IT) monetary policy framework on output growth in previous literature. However, it is generally agreed upon that IT has been effective in different capacities in industrialized and emerging market economies[1]. IT has been successfully applied in a majority of the world's developed countries and has become an attractive alternative for most developing countries seeking a solution to high and variable inflation (Mishkin, 2000). According to Calvo and Mishkin (2003), institutional frameworks influencing monetary policy outcomes in developing countries differ from those of developed countries in several ways. Developing countries have weaker fiscal organizations, less-developed financial organizations established with weak government adjustments, money agencies' have lower credibility, engage in currency substitution and responsibility dollarization and are lastly defenselessness against the sudden shocks to capital flows. Thus, according to Mishkin (2008), developing countries may use IT not only to achieve price stability, but also as a mechanism to help encourage necessary economic or monetary policy reforms, as well as strengthen their institutional capabilities. Adopting an IT framework can allow developing countries to create a consistent and steady macroeconomic environment in addition to stabilizing prices, which may create a more positive environment for economic growth in the country (Ozturk et al., 2014).

2.2.1. Inflation Targeting and Positive Impact on Growth:

Several studies have indicated that there are positive growth effects of IT. Brito and Bystedt (2006) use a difference in difference strategy using a sample of 13 Latin American countries (5 IT countries and 8 non-IT countries) from 1980 – 2006 to show that inflation targeting was a successful policy as implemented in the Latin America region, despite some of the weaker

[1] See Mollick et al. (2011)

institutional and economic environments under which Latin American countries adopted IT. Their study examines the actual inflation, expectations of future inflation, output growth, short term interest rate and overall market risk for all of the 13 countries. Their results indicate that as a result of the adoption of this policy, while there was no strong increase in output growth, growth rate volatility was significantly decreased. Additionally, they find evidence of an actual decrease in both growth rate and interest rate volatilities. Overall, the study shows that IT improved the economic performance in Latin America, as measured by a decrease in the level of inflation, inflation volatility, as well as the volatility of expected future inflation.

Mollick et al. (2011) examine the effect of inflation targeting on output growth using static panel data panel methods and dynamic models using a sample of 55 countries (22 industrial and 35 emerging, with 23 IT countries and 34 non-IT countries) from 1986-2004, which they define as 'key globalization years'. They find that the adoption of a full-inflation targeting regime[2] results in higher output income per capita for both industrial and emerging economies. Importantly however, the estimated long-run output impact of inflation targeting in their study measured using a dynamic model is lower for Emerging Market Economies. As they define the period of their study as 'key globalization years', they identify globalization as a factor that can affect output growth through productivity enhancing effects. Thus, using real output per capita growth as the dependent variable, the study includes controls for globalization in the analysis of IT's impact on growth. These globalization controls are Trade Openness (TO) and International Financial Integration (IFI) and a financial integration measure with respect to GDP and based on portfolio equity and FDI stocks (GEQ). To measure inflation targeting, they define two dummy variables, *ITsoft* and *ITfull,* as their analysis requires them to be as precise as possible about the

[2] IT regime in which there exists a public target and a commitment to it as a unique nominal anchor.

implementation of IT regimes. *ITsoft* is used when there is a simple announcement of a numerical target or a non-binding statement from the central bank that a country is switching to IT, and *ITfull* is used when representing the adoption of a fully-fledged IT regime in which there is a public target and a commitment to it as a unique nominal anchor. The empirical model that they estimate builds on past seminal empirical application of the traditional Solow model and on Islam (1995)'s reconsideration under panel data methods. They use static data methods to control for the traditional growth determinants, trade determinants and financial globalization. The dynamic model allows for the trade openness, investment and IT variables to be endogenous, which allows them to control for the reverse causality that investment and openness each have on output growth and for the possibility that output growth may lead to the adoption of an IT regime. They attribute the lower growth for Emerging Market Economies that they find to several factors, such as the fact that EMEs adopted IT later than industrialized nations, there exist lags in the monetary policy to take effect, and there are fundamental institutional differences between industrial and emerging economies. For the same reasons, their sample of countries is also divided into industrialized and emerging markets, as the two cannot be directly compared[3].

Amira, Mouldi and Feridun (2013) use annual data for 36 emerging market economies (15 IT countries and 26 non-IT countries) from 1979-2009 and find that IT has a positive and statistically significant effect on real output growth rate in emerging countries that have adopted inflation targeting more than in those countries that have not adopted the framework. They suggest that while IT results in higher economic growth, it does not guarantee a more stable growth rate. This is because the effectiveness of an IT policy depends critically on the structural parameters of the economy as well as the external dynamics. They use data from the IMF's Financial Statistics

[3] See also Calvo and Mishkin (2003)

Database and utilize a panel model inspired by that of Brito and Bysted (2010). Their sample is an unbalanced panel of emerging countries with data averaged over 3-year periods from 1979 to 2009 in order to make it possible to input the information contained in longer time series while holding down the number of instruments, a methodology that is also adopted from Brito and Bysted (2010). With real GDP growth rate as the dependent variable, they alter the original model to include a dummy variable for IT and one for high inflation above 40 per cent, in addition to time effects that capture common shocks to all countries, and cross-country fixed effects. They apply a two-step system GMM panel estimator to their study which helps controls for simultaneity and omitted variable biases. In order to account for various bias issues in their analysis, they estimate six different models.

Souza, Mendonca, Andrade (2014) find that there is a positive and constant effect on output after the adoption of IT, especially for developing countries. They utilize data from a total of 128 countries (of which 31 countries adopted IT during the period they study) from 1970-2007 in a macroeconomic panel data analysis. This study considers information from the128 countries, which represent 99 per cent of the world GDP and 97 per cent of the world population measured by Penn World Table (PWT), in an unbalanced panel data. They use three samples of counties: advanced economies, developing economies, and all economies. Unlike other studies that use micro-panel data analysis techniques and estimators, the authors build their own econometric models to study the collateral effects of IT on economic growth, with real GDP as the dependent variable. The authors find fault with models that have been used in previous studies as their methods assume cross-section independence which is not plausible when all countries are considered in the sample. This study proposes using a 'pulse dummy variable' which the authors construct in their models. The pulse dummy variable allows them to include in their analysis the

effect of the IT treatment in each period of time: at the moment of adoption of IT, before adoption, and after adoption. Hence the pulse dummy IT variable assumes the value of 1 at the moment of adoption (and for j periods before and after) and zero for the others. They find fault with the use of a regular dummy variable for IT, stating that this assumption requires constant and immediate effects of IT as a rule for all countries which can lead to very different estimates of treatment effects when these are not constant over time, and when the treatment only changes occasionally. Their use of a pulse dummy variable allows them to consider the dynamic effects of the IT treatment. Similar to Mollick et al. (2011), they also define the IT dummy as *ITsoft* and *ITfull*. Furthermore, in order to give robustness to the analysis, they extend it through the estimation of several models that consider samples used in the previous studies of Brito and Bystedt (2010) and Mollick et al. (2011), which are also discussed in this paper. Their results indicate that the adoption of IT implies gains in economic growth, or at least non-sluggish economic growth for all groups considered.

As a critique, Brito and Bystedt (2006) do not control for periods of hyperinflation in the countries that they study, as this could have biased their results since several Latin American countries, one example being Brazil, faced long periods of hyperinflation in the time period that this study considers. As a matter of fact, none of the studies discussed in this subsection control for hyperinflation. As for why developing countries should not be directly compared with developed countries, Mollick et al. (2011) give reasons stated above very similar to the arguments presented by Calvo and Mishkin (2003) in their work. However, unlike Mollick et al. (2011), Souza, Mendonca, Andrade (2014) do not limit or separate their analysis to only industrialized and emerging market economies as two groups, but to their benefit also have a 'all countries' group, in which they analyze the two as one. Overall, this gives their results more context as they can

compare the estimates from the three groups of countries to draw comprehensive policy conclusions. Similar to Mollick et al. (2011), Souza et al. (2013) also utilize controls for the traditional determinants of economic growth: the population growth rate and investment to GDP ratio. Lastly, similar to the study conducted by Ayres (2010), Amira, Mouldi and Feridun (2013) utilize a panel model inspired by that of Brito and Bysted (2010), as is the popular practice in existing literature.

2.2.2. Inflation Targeting and Negative Impact on Growth:

Other have shown that inflation targeting may not be as effective as some studies may claim, both in regard to curbing inflation volatility or impacting economic growth. Svensson (2010), through a review of existing literature on IT and output growth, concludes that there is no significant effect of inflation targeting on growth. Other studies refer to inflation targeting as simply a 'window dressing' strategy (Brito and Bystedt, 2010), which may result in some positive impact on price stability and thus economic growth because the Central Banks publically announce their targets for inflation and appear more committed to achieving price stability.

Barito and Bystedt (2010) extend on their previous research on Inflation targeting in Latin America (Brito and Bystedt, 2006) by including a unified sample of those thirteen inflation-targeting countries studied by Goncalves and Salles (2008) and Batini and Laxton (2007) and forty-six non-targeting countries, and find that inflation targeting as a whole does not improve performance as defined by output growth and inflation, while it may be effective in a single region or economy. The authors thus concur with the view that IT is a form of 'conservative window dressing'. They agree with the idea that IT in developing country reduces inflation rates, and disqualify their previous finding (Brito and Bystedt, 2006) that IT helps reduce growth and interest

rate volatility. Using OLS and a Fixed Effects model which exploits time and country dimensions to isolate the improvements in performance exclusively from IT regimes and an expanded sample of 46 countries (13 IT countries and 33 non-IT countries), they find a non-significant and weak decline in inflation and weak growth in GDP. The authors show that there is no evidence that inflation-targeting improves performance as evidenced by both inflation and output growth. Additionally, the authors are able to show there is lower output growth during inflation targeting adoption. Unique to their study, they measure the expected inflation in the countries they sample as being dependent on three-year averages of inflation, something which is more realistic to practice and is replicated in serval studies that follow them. Through this study, the authors are basically able to show that IT's success was not as strong as they had previously thought. (Brito and Bystedt, 2006).

Ayres et al. (2014) uses methodology put forward by Brito and Bystedt (2010) and apply it to a large sample of 51 similar developing countries (17 IT countries and 34 non-IT countries) from 1985-2010. They break their data down into six regions ((Asia; Eastern and Southern Europe; Latin America and the Caribbean; Middle East and North Africa; Oceania; and Sub-Saharan Africa). This study finds that generally while inflation targeting is a helpful tool in reducing inflation, the direct impact on growth is fairly limited. If at all, the positive impact on growth is short term. Unlike previous studies, they examine the effects of inflation targeting on different regions of the world in order to capture regional effects following evidence from Brito and Bystedt (2006) that there are regional specific effects of Inflation Targeting. In terms of regional effects, they find statistically significant GDP growth in developing countries in only the regions of Europe, Latin America and the Middle East. As variables, they consider a high inflation dummy, a time measure dummy variable, a dummy variable that captures the effect of the Asian Financial

Crisis on the sample. They improve upon the Barito and Bystedt (2010) model by including their regional dummy variables to account for variation in both inflation rates as well as the impact of inflation targeting policy across regions. This allows them to better identify successes and failures of inflation targeting regimes. To account for the impact on economic growth, they augment their base model by replacing the single measure of inflation targeting with a vector measuring the impact of inflation targeting over time. Since economic growth is also dependent on interest rates, they include the change in interest rates and lag of growth as controls in their model. Their inflation targeting lag vector encompasses up to eight quarters of lags to identify when and how inflation targeting impacts economic growth. Unique to their study, they identify the direct impact of inflation targeting on real economic growth by considering the length of time that an inflation targeting regime change needs before there is a positive impact on growth.

While Ayres (2014) takes into consideration effects of the Asian Financial Crisis into their analysis to control for the price fluctuations that occurred during that crisis in the economies that they study, they do not introduce similar controls for the Great Recession of 2008-09, which also took place during the time frame they study (1985 – 2010). This could heavily influence their results as the Great Recession denotes the first major shock to the global economy since the relatively broad dissemination of inflation targeting regimes worldwide. Additionally, Ayres et al. (2014) adopt and build on Brito and Bystedt (2010)'s methodology, and while the time periods they study differ marginally, they both have similar conclusions regarding IT's growth effects. Brito and Bystedt (2010) consider the years 1980 - 2006, while Ayres et al. (2014) consider 1985-2010. While the controlling for the Global Financial Crisis (2008-09) is out of the time period for Brito and Bystedt (2010), it should be included in the work of Ayres et al. (2014), and perhaps have led them to different conclusions about the growth performance of IT countries.

2.3. Inflation Targeting and Economic Growth in Emerging Economies in the Post-Global Financial Crisis Era:

The Global Financial Crisis of 2008-09 and the following recession constitute the first major global economic downturn since the relatively broad dissemination of inflation targeting regimes worldwide. Not many studies have taken into consideration the impact that the Global Financial Crisis and Great Recession of 2008-09 had on the inflation targeting and economic growth relationship. Over the past few decades, IT was adopted by several countries with the main objective of achieving price stability, such as India, Argentina and Japan. However, as Souza et al. (2013) point out, the recent subprime crisis challenged the capacity of an IT monetary regime to create a macroeconomic environment that permits a recovery in economic activity.

Most of the recent literature addressing this topic indicates that IT countries in general had smaller decelerations in growth than their peers when facing the recent global financial crisis (de Carvalho Filho, 2011). Even prior to the Global Financial Crisis, researchers observed that the adoption of IT entails a positive impact on output growth (Mollick et al., 2011). Ozturk et al. (2014) analyze growth rate trends in developing and developed countries and find that the development performance of developing countries not practicing inflation targeting was better than those practicing it in the two-year period before the crisis and after crisis, with the difference between the two groups decreasing to very low levels after crisis. On the other hand, developed countries participating in IT did better than those not participating in IT in the same periods. In this context, the author suggests that central banks should re-evaluate the attractiveness of an inflation targeting strategy again in the light of global crisis. However, this analysis is based purely on data trends, and is supported by no empirical testing. On the other hand, de Carvalho Filho

(2011) through a study conducted by the International Monetary Fund (IMF) finds that the evidence on post-crisis GDP growth is flattering for inflation targeting countries. Using a sample of 51 advanced and emerging countries (23 IT countries, 27 non-IT countries) and simple econometric frameworks on a balanced panel dataset of macroeconomic variables by country, this study finds that IT countries are top performers in terms of GDP growth for post-crisis growth in absolute terms and also relative to pre-crisis growth trends. Importantly, the US is dropped from the sample of countries selected in this study as the Great Recession originated there, and the study aims to determine whether IT was a relevant determinant of performance in the aftermath of that exogenous shock. As for reasons why, IT countries may have performed better during the recession, as indicated by the results, de Carvalho Filho (2011) identifies a few. IT countries had higher nominal and real interest rates during the expansion phase prior to the crisis. As such, countries with higher nominal interest rates in the event of a crisis have more room for rate cuts and less of a need for extraordinary fiscal measures. This tight monetary stance during the build-up to the crisis may have prevented lending booms or reduced the attractiveness of high-yield foreign assets of doubtful quality, such as U.S. subprime mortgage to their own financial systems, and thus may have insulated IT countries from the shock when the housing bubble burst in 2008. In addition, there is a significant correlation between inflation targeting and flexible exchange rate regimes, which have been recognized as shock-absorbers in pervious literature[4] and may be a factor that boosted the relative performance of IT countries. The study is unique in that it diverges from existing literature which mostly looks at the Great Moderation years and studies inflation targeting over a number of years, rather than examine the effect of the policy as a response to a specific shock, such as the Great Recession.

[4] Broda, 2004; Edwards and Levy Yeyati, 2005; Mendoza 1995

As a critique, Ozturk et al. (2014)'s analysis is based only on data trends, and no regression analysis on the data used in the study is conducted. While the author includes data tables in his analysis, there is no empirical evidence to show that the trends indicated by the data are significant. de Carvalho Filho (2011) studies the performance of IT countries during and after the recession but does not specify clearly the time period that they are studying. Ozturk et al. (2014) study the two-year periods before and after the crisis, i.e., their study spans 2005 – 2011. While the two studies are examining essentially the same topic, they find vastly different results when it comes to developing economies. It would be interesting to see Ozturk et al. (2014)'s data trend analysis put through empirical testing, to determine whether the results and conclusions are similar to de Carvalho Filho (2011)'s that all IT countries performed spectacularly during and after the recession.

3. Analytical Framework:

3.1. Data and Methodology:

The panel dataset used in this study is compiled using data primarily from the Penn World Tables 9.0, IMF's Financial Statistics Database, and World Bank Data for the years 1991 - 2014. Since some emerging markets suffer from significant exchange rate volatility and strong episodes of currency depreciations[5], I opted to use real output figures for all of my variables. The resulting dataset is an unbalanced paneldata set, with a total of 300 observations.

An adapted sample of countries based on the sample used by de Carvalho Filho (2011) is used in this study. My sample encompasses 20 developing countries, 13 of which are inflation targeters and 7 of which are not inflation targeters. de Carvalho Filho (2011) identifies sample

[5] See Mollick et al. (2011)

selection as crucial for the credibility of their study. The countries used in their sample are selected based on data availability (monthly data availability on the unemployment rate, industrial production, policy interest rate and the sovereign 5-year CSD spread, and only countries for which at least three of these data are available are used). Additionally, a size cut off of USD 10 billion for the 2002 nominal GDP in dollars is used for country selection because small poor developing countries typically do not have the institutional capability for inflation targeting and would not be an appropriate comparison group for developed IT countries.

For the purposes of my study, the original sample of countries used by de Carvalho Filho (2011) is amended in two ways. First, it is amended to exclude advanced economies from the list of countries. As Mollick et al. (2011) point out, emerging markets and industrialized economies cannot be directly compared for several reasons. Each of these groups started to experiment with IT at different times, and most EMEs started to experiment with IT only in the second half of the 1990s. There are also fundamental institutional differences between the two groups, such as less developed financial markets and lower credibility of financial institutions in developing countries, which make it more difficult to design and implement monetary policies. Thus, industrialized economies are excluded from my sample. Secondly, from the remaining group of developing countries the recent inflation targeters, India and Argentina, are excluded since this study aims to draw policy recommendations for such countries. A detailed list of the updated sample is provided in **Table 1.a.** Since inflation targeting has also been found to have regional effects (Aryes et al., 2014), a regional breakdown of countries is provided in **Table 1.b.**

To assess the impact that inflation targeting had on economic growth between 1991 and 2014, the annual real GDP per capita growth rate is used as the dependent variable, sourced from the Penn World Table 9.0. This variable has been used in past studies examining the same

relationship, and thus make this study comparable to those, namely Mollick et al. (2011), Brito and Bystedt and Ayres et al. (2014) which all utilize some measure of real output growth to account for economic growth in their selected sample of countries. Furthermore, I introduce controls for globalization to my analysis. Similar to Mollick et al. (2014), I use Trade Openness (total imports and exports as a share of GDP) as a control for globalization, as the authors identify the period from 1986-2004 as 'key globalization years'. I also introduce controls for traditional growth variables that have been found to be robust for different samples and model specifications (Souza et al. 2014). This is the population growth rate, and I include domestic absorption (total domestic consumption and investment) as an additional control for economic growth.

Thus, I use eleven independent variables to examine IT's effect on growth during period of global financial crisis. These are the lagged real GDP per capita growth rate, CPI inflation, expected inflation (lagged CPI inflation), the real interest rate, real exchange rates, trade openness (imports and exports as a share of GDP), domestic absorption (total domestic consumption and investment), the population growth rate, an IT dummy variable, a Global Crisis dummy variable, and an interaction dummy variable ITGC (the IT dummy multiplied by the Global Crisis dummy variable). Of these eleven variables, the nine are sourced from traditional literature, while the Global Crisis dummy variable, the interaction dummy variable, ITGC, are this study's contribution to previous literature.

I use simple Fixed-Effects and Random-Effects (OLS) Models on a panel dataset of 20 developing countries to estimate the relationship between IT and economic growth, especially during times of global crisis. Based on evidence from Ayres (2014) that inflation targeting may have regional effects due to the institutional differences in each region's governments, central banks and other factors, I further break my sample of 20 countries down into the regions of Asia,

Europe, Latin America, and include a group for the five Emerging Market Economies present in the sample (**Table 1.b.**).

3.2. Regression Equation and Empirical Models:

The model used for each analysis is based on multicollinearity and robustness testing using the Hausman Test **(Table 4)**. The test indicated that for the Europe region, Asia region and at the World level a Random-Effects Model was the correct specification, while for the Latin America region and Emerging Market Economies group, a Fixed-Effects Model was the correct specification. The regression equation remains the same for each of these models and is based largely on the empirical model estimated by Mollick et al. (2014).

$$\mathbf{Y}_{it} = \beta_0 + \beta_1 \mathbf{Y}_{it-1} - \beta_2 \mathbf{Inf}_{it} - \beta_3 \mathbf{Inf}_{it-1} - \beta_4 \mathbf{Int}_{it} + \beta_5 \mathbf{IT}_{it} - \beta_6 \mathbf{GC}_{it}$$
$$+ \beta_7 \mathbf{ITGC}_{it} + \beta_8 \mathbf{ExRate}_{it} + \beta_9 \mathbf{Trade}_{it} + \beta_{10} \mathbf{Invest}_{it} + \beta_{11} \mathbf{Popgrow} + \varepsilon_{it.}$$

$\mathbf{Y}_{it}$ represents the real output per capita growth, the dependent variable. $\mathbf{Y}_{it-1}$, represents the real GDP per capita growth rate lagged by one year and has been used in several studies examining the IT and economic growth relationship[6]. It allows for the model to capture persistence and mean-reverting dynamics (Brito and Bystedt, 2010) and to accommodate slower output adjustment (Mollick et al. 2014). Based on evidence from Mollick et al. (2011) and Brito and Bystedt (2010) this variable is expected to have a positive impact on output per capita growth ($\beta_1 > 0$).

[6] Aryes et al. (2014), Mollick et al. (2011), Brito and Bystedt (2010).

Inf_{it} represents the CPI inflation variable, and a key variable used to capture inflation variability for the sample of countries. Furthermore, lagged inflation, **Inf_{it-1},** is used to account for expected inflation, as expected inflation is known to become realized future inflation. Additionally, IT regimes are supposed to work through inflation expectations (Brito and Bystedt, 2006). Both of these are expected to have a negative impact on output per capita growth, due to the inflation-output tradeoff relationship as defined by the Philips Curve. An increase in inflation and inflation expectations is expected to cause a decrease in output per capita growth.[7] Thus, I expect $\beta_2 < 0$ and $\beta_3 < 0$.

Int_{it} represents the real interest rate. Bystedt (2006) identify that IT regimes make active use of interest rate instruments, and infer that IT implies more volatile interest rates. Aryes et al. (2014) identify economic growth as dependent on the interest rate and include it in their analysis as a control for growth. Based on their results, this variable is expected to have a negative impact on economic growth ($\beta_4 < 0$) Brito and

$IT_{it,}$ is the IT dummy variable and equals 1 for all the countries that adopted inflation targeting starting with the first year that they announced the adoption of an inflation targeting regime. For all other countries and time periods, the variable equals 0. I expect $\beta_5 > 0$ (positive discipline effects of low inflation) if a strong commitment to low inflation helps productivity and then output growth. Conversely, $\beta_5 < 0$ would imply negative output effects of inflation targeting (Mollick et al. 2014).

GC_{it} is a dummy variable accounting for periods of global crisis between the years of 1991 and 2014. It accounts for global crises, i.e. recessions and financial crises, that had an impact on the international level and equals 1 for all counties for years of the Asian Financial Crisis (1997-

[7] Brito and Bystedt (2010).

1999), and for the years of the global financial crisis and Great Recession (2007-2009). For all other years, the variable equals zero. Since a recession is defined as concurrent quarters of decline in economic growth, I expect $\beta_6 < 0$. Past studies have introduced controls in their analysis for the Asian Financial Crisis (Ayres et al. 2014), but do not control for the effects of the Global Financial Crisis/ Great Recession of 2007-08. On the other hand, de Carvello Filho (2011) considers only the Great Recession in his analysis on IT's impact on economic growth.

Unique to this study, $\mathbf{ITGC}_{it}$ is an interaction dummy variable, obtained by multiplying the IT_{it} and GC_{it} dummies. It is indicative of the impact of inflation targeting on economic growth only during periods of global crises and equals 1 for all the years that fit these criteria and equals zero for all other years. Based on the evidence presented by de Carvello Filho (2011) that inflation targeting economies performed better than non-inflation targeting economies in terms of economic growth and industrial production in the short term before and after the great recession, I expect $\beta_7 > 0$ for all models, i.e., inflation targeting during periods of global crisis had a positive impact on output per capita growth in developing countries.

$\mathbf{Trade}_{it}$, trade openness defined in logs, is included to account for globalization between the years of 1991-2014 based on evidence from Mollick et al. (2011) that this period also accounts for the key globalization years in history. also use this variable in their analysis. I expect $\beta_9 > 0$ on the basis of more circulation of trade or financial flows helping the productive sector (Mollick et al., 2011)

$\mathbf{ExRate}_{it}$ is the real effective exchange rate for all countries, defined in logs. I use this variable to control for the impact that the real exchange rate in developing countries has on economic growth. The real effective exchange rate of IT countries depreciated sharply in relation to other countries with the onset of the global crisis. Taking August 2008 as a base period, the median IT

currency depreciated by about 12½ percentage points by the first quarter of 2009 before it bounced back through the rest of that year (de Carvalho Filho, 2011). Additionally, since a higher exchange rare is beneficial for developing countries in that they are able to improve their terms of trade, I expect $\beta_8 > 0$.

As rhobust determinants of economic growth[8] defined in logs, $\mathbf{Popgrow}_{it}$ represents the population growth rate. From the traditional Solow (1956) model, the population growth traditionally decreases income per capita ($\beta_{11} < 0$) (Mollick et al., 2014). $\mathbf{Invest}_{it}$ represents domestic absorption and is expected to have a positive impact on output per capita ($\beta_{10} > 0$), as increased domestic consumption and investment are known to lead to higher output in traditional growth literature.

Finally, ε_{it} is the stochastic error term.

4. Discussion of Results:

My results indicate that inflation targeting during periods of global crisis had strong and positive impacts on output growth per capita for inflation targeting countries, for all groups considered. However, this result was statistically significant only on the World Level, and for the Asia region. This result for Asia was strongly positive, approximately a 6 per cent increase in real output growth per capita for every year that an Asian country in the sample used IT in a period of global crisis (Table 3). Ayres et al. (2014) control for the Asian Financial crisis in their study and find that overall, Asian countries in their sample faced a net overall 0.5 per cent downward shift in growth rates as a result of the adoption of inflation targeting. So, while the adoption of such a policy in developing Asian economies may warrant a slight drop in growth post adoption, my

[8] See also Souza et al. (2014) and Mollick et al. (2011).

results indicate that they may be better insulated from declines in growth during periods of global economic crises because they chose to adopt inflation targeting regimes. On the World level, I find that inflation targeting during periods of global crisis significantly increased over all developing world economic growth. Though the results for this variable were not statistically significant for the Latin America, Europe and Emerging Market Economies groups, their coefficients were positive and combined with the significantly positive result on the World level, it can be inferred that inflation targeting during periods of global crisis in developing economies around the world could help increase the world's real output per capita growth by approximately 4.1 per cent for every year that developing countries implement inflation targeting.

I also find that in general, IT had a negative impact on economic growth on the World level and in all regions of Asia, Latin America and Europe, and a small positive impact for the Emerging Market Economies group. This result was statistically significant only for the Latin America region. For every year that a developing Latin American economy implemented inflation targeting, it saw a 4.38 per cent decline in real output per capita growth (Table 3). This directly contradicts the findings of Brito and Bystedt (2006), Ayres et al. (2014), and B. Amira et al. (2013). Brito and Bystedt (2006) in their study of 13 Latin American economies (5 IT adopters and 8 non-IT) found that inflation targeting was a successfully implemented policy and led to strong growth in GDP in the region. This difference in results may be due to the different methodologies used in their study compared to this study. In my sample of Latin American economies, there are 7 developing countries (5 IT, and 1 non-IT), whereas Brito and Bystedt (2006) in their sample of 13 countries include both developed and developing economies. Additionally, they consider a longer time frame, from 1980- 2006, compared to this study, which spans the years 1991-2014 and considers period more recent in history. Importantly, this study uniquely controls for the effects of the Great

Recession on output per capita growth amongst other crises, which is arguably the first major shock since the relatively broad dissemination of inflation targeting regimes worldwide (de Carvalho Filho, 2011). In their study, Brito and Bystedt (2006) control for 'exogenous shocks', but do not control explicitly for any specific periods of recession or global shocks during their time frame, for example the Asian Financial Crisis. Additionally, Amira et al. (2013) find that the IT dummy coefficient is significantly positive in all models in their study of IT's impact on growth in developing countries, which affirms for them that IT is associated with an increase in real economic growth. Their coefficient of the IT dummy ranges between 1.28 and 0.99, which implies that the average real economic growth is increased by 1.28–0.99 percentage points more in IT countries than in non-IT countries. Additionally, Mollick et al. (2014) indicate based on their findings that targeting inflation seems to be more relevant for emerging economies than for industrial economies irrespective of whether a full or partial IT regime is considered. Ayres et al. (2014) find that the quarter in which there is a regime change to an inflation targeting policy, growth will slow by 5 per cent. However, the following quarter will feature a 6.7 per cent increase in the growth rate. Thus, in their sample of countries, the net two-period increase in growth from inflation targeting is 1.7 per cent.

The lagged output per capita growth rate variable, lagged by one period, is found to have the expected positive impact on real output per capita growth, statistically significant for the Developing World, Asia, Latin America and Europe regions, but not for the Emerging Market Economies group. This variable was a control variable that allowed for the model to capture persistence and mean-reverting dynamics (Brito and Bystedt, 2010) and to accommodate slower output adjustment (Mollick et al. 2014). These results are also similar to those found by Mollick et al. (2011) and Brito and Bystedt (2010) in their study of IT's impact on growth as expected.

The CPI inflation variable is found to have a small and statistically significant negative impact on output per capita growth as expected. This indicates that higher CPI inflation in a given developing country by 1 per cent in a year results in an approximately 0.006 percent decline in growth in the World, an approximately 0.2 per cent decline in growth in Asia, an approximately 0.4 per cent decline in growth in Latin America, an approximately 0.006 per cent decline in Europe, and finally a 0.09 per cent decline in Emerging Market Economies. The expected inflation variable, which is simply the CPI inflation lagged by one period, has the expected negative significant impact on the World level and Europe region, but is while significant is surprisingly positive for the Asia and Latin America regions, and for the Emerging Market economies group. According to Brito and Bystedt (2010)'s estimations, an increase in inflation and inflation expectations is expected to cause a decrease in output per capita growth. While my model indicates that this is the case in the Developing World and the Europe region, in Asia, Latin America and the Emerging Market Economies, an increase in inflation expectations in a year causes an increase in growth by 0.16 per cent in Asia, by 1.4 per cent in Latin America, and by 0.04 per cent in Emerging Market Economies.

As expected, the Global Crisis dummy variable has the expected negative impact on economic growth in all groups considered. However, this result is insignificant for the Emerging Market Economies group. For every year that a developing country is impacted by an international financial crises or recession, output per capita growth falls by 4.5 percent on the developing word level, by 4.3 per cent in the Asia region, by 3.6 per cent in the Latin America region, and finally by 5.5 per cent in the Europe region.

Importantly for the Asia region, if growth is expected to fall for a non-IT country by 4.3 per cent during a year of global crisis but increase by 6.9 per cent for an IT country in the same

period (Table 3, Column 3), the incentive for a non-IT country to switch over to an IT framework is that net 2.6 per cent increase in growth while weathering the effects of a global economic downturn.

The real interest rate variable exhibits the expected and significant negative impact on growth for all groups considered. This means that in all regions of the developing world and on the world level itself, an increase in the real interest rate leads to a decrease in economic growth, less than 1 per cent in all cases. However, one limitation of this result is that data for the real interest rate obtained from the IMF database was missing for several countries included in my sample. This data, though used in previous literature cited in this study, have countless missing observations, and thus made the panel dataset heavily unbalanced.

Trade Openness, used as an indicator for globalization in this study, has the expected positive impact on growth in Latin America and Emerging Market Economies, but shows a negative impact on growth on the world level, in the Asia region and the in the Europe region. These results are statistically significant only for the Asia region and the Emerging Market Economies group. This indicates that in Asia's developing economies, greater globalization by 1 per cent leads to a decrease in economic growth by 2.9 per cent. On the other hand, for Emerging Market Economies, greater globalization by 1 per cent leads to a 6.9 per cent increase in economic growth. This indicates that in these Emerging Markets, it is trade openness and greater globalization that is accounting for their spectacular growth (amongst other factors), and not inflation targeting during periods of global crisis. Mollick et al. (2014) in their study also find that that globalization helps economic growth in the long run, with trade openness leading to higher output growth than any other measure of globalization.

The real exchange rate variable, included to account for exchange rate fluctuations in IT countries during global crises, is significant only for the Emerging Market Economies and Asia groups and is found to have a strongly positive impact on economic growth, as expected. My results indicate that as the exchange rate increases, economic growth increases by 7.9% for every 1 per cent increase in the exchange rate for the Emerging Market Economies. In Asian economies, this result is significant only at the 10 per cent level but indicates that economic growth increases by 9.90 per cent as the exchange rate increases by 1 per cent. Thus, for the Emerging Market economies group, I argue that based on my models and analysis, it is not inflation targeting during periods of global crisis but trade openness and high exchange rates together that account for the spectacular economic growth the Emerging Market Economies exhibit. One reason for this could be the more beneficial terms of trade that result from having a higher exchange rate. For example, de Carvalho Filho (2014) found that higher Terms of Trade had a positive impact on GDP growth rates since the Global Financial Crisis. While I have included a control for exchange rates in my analysis, one limitation is that I did not include controls for exchange rate volatility, which may have been more telling of the impact of exchange rate fluctuations when analyzing IT's growth effects during times of global financial and economic crises.

Included as a control for traditional determinants of economic growth derived from the Solow model (1956), the population growth rate result is also statistically significant only for the Emerging Market Economies group. My results indicate that for every 1 per cent increase in the population growth rate, output per capita growth decreased by approximately 3.28 per cent. Mollick et al. (2014) found that for their emerging economies sample the coefficients for population growth were in all cases negative and strongly significant. This is consistent with the fact that population growth rates in emerging economies are typically larger than those of their

aggregate output, a situation that ultimately affects their income per capita growth, and applies to the result of this study as well.

Lastly, the domestic absorption variable exhibits an unexpected negative impact on growth and significant only for the Emerging Market Economies group. It indicates that for every 1 per cent increase in domestic absorption, economic growth decreases by approximately 6 per cent, a relatively large decrease. As this goes against traditional growth literature that increase consumption and investment have a beneficial impact on output, this result is surprising. While I have used domestic absorption to represent investment and consumption as a control for traditional determinants of growth, other studies use the investment to GDP ratio as control for the traditional determinants of economic growth, that has been found to be rhobust for different models in addition to the population growth rate variables. This is something that can be included in the analysis of future studies, or future replications of this study.

5. Conclusions and Policy Implications:

I have examined in this paper the relationship between IT and real output per capita income growth for a group of twenty emerging economies. In doing so, I departed from the traditional neoclassical growth literature and its empirical testing by augmenting the output growth model and introduced controls for globalization, inflation targeting, global financial and economic crises and inflation targeting during periods of global financial and economic crisis.

Overall, I find, that the adoption of an IT regime during periods of global financial and economic crisis results in greater economic growth on the World level and especially in the Asia region for developing countries. This stands as a policy lesson for developing Asian economies, such as for example China and Malaysia, which are included in this sample but do not practice

inflation targeting. When faced with recessions or periods of financial crisis, these economies may be able perform better in terms of output income per capita growth than their peers as inflation targeting economies, to be specific approximately a 2.6 per cent net increase in growth. I also find inflation targeting in general to have a small negative effect on growth, significantly in Latin America. Additionally, in Emerging Market Economies, it is greater globalization measured by trade openness and appreciating exchange rates that leads to greater economic growth.

Countries that followed IT regimes before and during the crisis were able to keep fiscal discipline, tight monetary policy, flexible exchange rate regimes and build large international foreign reserves. Therefore, with the onset of the crisis, they were able to whether the effects of the crisis better. In many of these economies, the fall in output growth was much less prominent than in those countries with weaker basics, and the pace of recovery has also been faster. In addition, the fact that an increasing number of recent studies in the post-recession era are indicating that inflation targeting economies did better in terms of growth during and after the recession has significant policy lessons for policy makers. This is in the developed and developing world alike.

The results indicate that IT regimes have different regional effects in affecting output growth in general and in periods of global financial and economic crisis. In advising individual countries for example, the World Bank, may take a more regional approach to promote economic growth and resilience before, after and during international economic downturns in a particular region. Individual Central Banks and international institutions such as the World Bank and IMF may establish periodic policy roundtables discussing why regional differences exist and thereafter promote research and policy framing on a more regional level to estimate the impact that inflation targeting has during periods of global crisis within each region. Individual countries and regions, such as developing countries in the Asian continent, may establish new forms of cooperation to

design comprehensive policy objectives at a more regional level to achieve a sustainable level of economic growth, even in periods of global economic downturns. For example, the said Asian economies could form new regional unions or could use existing unions such as the ASEAN to further improve regional growth performance and resilience during global financial and economic crises by coordinating their monetary, fiscal, exchange rate and other trade policies accordingly.

Tables and Figures

Table 1.a.: Countries included in the sample:

Inflation Targeters (13)	Non- Inflation Targeters (7)
Brazil Chile Colombia Hungary Indonesia Mexico Peru Philippines Poland Romania South Africa Thailand Turkey	China, PR Mainland Croatia Kazakhstan Malaysia Russian Federation Ukraine Venezuela

Table 1.b.: Regional Breakdown of countries included in the sample:

World (20)	**Asia (6)**	**Latin America (6)**	**Europe (7)**	**Emerging Market Economies (5)**
Brazil Chile Colombia Hungary Indonesia Mexico Peru Philippines Poland Romania South Africa Thailand Turkey China, PR Mainland Croatia Kazakhstan Malaysia Russian Federation Ukraine Venezuela	China Indonesia Kazakhstan Philippines Malaysia Thailand	Brazil Chile Colombia Mexico Peru Venezuela	Croatia Hungary Poland Romania Russian Federation Ukraine Turkey	Brazil China Russian Federation South Africa

Figure 1. Regression Equation used for Models 1 – 5:

$$Y_{it} = \beta_0 + \beta_1 Y_{it-1} - \beta_2 Inf_{it} - \beta_3 Inf_{it-1} - \beta_4 Int_{it} + \beta_5 IT_{it} - \beta_6 GC_{it}$$
$$+ \beta_7 ITGC_{it} + \beta_8 ExRate_{it} + \beta_9 Trade_{it} + \beta_{10} Invest_{it} + \beta_{11} Popgrow + \varepsilon_{it}$$

Table 2: Variables and Expected Coefficients:

VARIABLES	SIGNIFICANCE	EXPECTED COEFFICIENTS
Y_{it}	Real output per capita growth rate	(Dependent Variable)
Y_{it-1}	Real GDP per capita growth rate lagged by one year	$(\beta_1 > 0)$
Inf_{it}	CPI inflation	$(\beta_2 < 0)$
Inf_{it-1}	Expected inflation	$(\beta_3 < 0)$
Int_{it}	Real Interest Rate	$(\beta_4 < 0)$
IT_{it}	IT dummy variable	$(\beta_5 > 0)$ OR $(\beta_5 < 0)$
GC_{it}	Dummy variable accounting for periods of global crisis	$(\beta_6 < 0)$
$ITGC_{it}$	Interaction dummy variable, obtained by multiplying the IT_{it} and GC_{it} dummies	$(\beta_7 > 0)$
$ExRate_{it}$	Logged Real effective exchange rate for all countries	$(\beta_8 > 0)$
$Trade_{it}$	Logged Trade Openness	$(\beta_9 > 0)$
$Invest_{it}$	Logged Domestic Absorption	$(\beta_{10} > 0)$
Popgrow	Population Growth Rate	$(\beta_{11} < 0)$
ε_{it}	Stochastic error term	

Table 3: Results from Fixed Effects and Radom Effects Models (OLS):

	WORLD (MODEL 1)	ASIA (MODEL 2)	LATIN AMERICA (MODEL 3)	EUROPE (MODEL 4)	EMERGING MARKET ECONOMIES (MODEL 5)
LAGGED REAL GDP PER CAPITA GROWTH	0.306*** (0.053)	0.203* (0.109)	0.205** (0.078)	0.219*** (0.077)	0.035 (0.092)
CPI INFLATION	-0.006*** (0.001)	-0.204** (0.085)	-0.408*** (0.0753)	-0.006** (0.002)	-0.090*** (0.033)
EXPECTED INFLATION	-0.004*** (0.001)	0.163** (0.066)	0.138** (0.068)	-0.004* (0.002)	0.038** (.015)
IT DUMMY	-0.659 (0.919)	-1.685 (1.782)	-4.381* (2.206)	-0.128 (3.864)	0.809 (1.482)
GLOBAL CRISIS DUMMY	-4.535*** (1.031)	-4.278*** (1.598)	-3.257* (1.891)	-5.503* (2.836)	-1.864 (1.235)
IT X GLOBAL CRISIS DUMMY	4.113** (1.625)	6.883** (2.801)	2.823 (2.486)	1.267 (6.272)	1.808 (1.824)
REAL INTEREST RATE	-0.087*** (0.031)	-0.350** (0.140)	-0.398*** (0.077)	-0.080 (0.087)	-0.202*** (0.062)
REAL EXCHANGE RATE	1.488 (1.685)	9.920* (5.479)	-5.225 (4.132)	5.172 (9.369)	7.941** (3.549)
TRADE OPENNESS	-1.204 (0.772)	-2.913** (1.22)	4.810 (4.076)	-5.915 (8.808)	6.989** (3.176)
DOMESTIC ABSORPTION	-0.197 (0.352)	0.130 (1.078)	0.025 (2.313)	1.039 (3.076)	-6.026*** (2.190)
POPULATION GROWTH RATE	-0.605 (0.390)	-0.098 (0.970)	4.744 (5.294)	-2.730 (3.128)	-3.279** (1.345)
CONSTANT	-6.181 (8.814)	-27.814 (27.335)	11.152 (40.722)	-6.810 (32.205)	25.212 (22.586)
HAUSMAN TEST	0.556	0.249	0.045	0.996	0.009
OBSERVATIONS	300	108	123	45	91
R2 OVERALL	0.293	0.376	0.123	0.580	0.208
R2 BETWEEN	0.405	0.749	0.065	0.582	0.322

The symbols ***, **, * refer to 1%, 5%, and 10% significance levels.

Table 4: Multicollinearity testing using the Variance Inflation Factor (VIF):

a. **Model 1:** Random-Effects Model (World):

Variable	***VIF***
IT x Global Crisis Dummy	2.08
Real Interest Rate	1.93
Global Crisis Dummy	1.78
IT dummy	1.76
Trade Openness	1.47
CPI Inflation	1.37
Expected CPI Inflation	1.29
Domestic Absorption	1.28
Lagged Real GDP per capita	1.17
Real Exchange Rate	1.09
Population growth Rate	1.05
Mean VIF	**1.48**

Note: The Hausman Test was used to differentiate between Fixed Effects and Random Effects Models. In this case, the p-value was greater than 0.05, and the null hypothesis that the difference in coefficients is not systematic could not be rejected, and the test indicated that the Random Effects Model was the correct specification.

b. **Model 2:** Random-Effects Model (Asia):

Variable	***VIF***
Real Exchange Rate	3.80
CPI Inflation	3.61
IT Dummy	3.38
Real Interest Rate	2.87
IT x GC Dummy	2.57
Domestic Absorption	2.40
Expected CPI Inflation	2.15
Lagged Real GDP per capita	2.09
Global Crisis Dummy	2.07
Population Growth Rate	1.68
Trade Openness	1.55
Mean VIF	**2.56**

Note: The Hausman Test was used to differentiate between Fixed Effects and Random Effects Models. In this case, the p-value was greater than 0.05, and the null hypothesis that the difference in coefficients is not systematic could not be rejected, and the test indicated that the Random Effects Model was the correct specification.

c. **Model 3:** Fixed-Effects Model (Latin America):

Variable	***VIF***
CPI Inflation	4.57
Population Growth Rate	4.02
Expected CPI Inflation	3.67
IT Dummy	3.38
Real Interest Rate	3.25
Trade Openness	3.04
Global Crisis Dummy	2.59
IT x GC Dummy	2.53
Real Exchange Rate	2.18
Domestic Absorption	1.58
Lagged Real GDP per Capita	1.18
Mean VIF	**2.91**

Note: The Hausman Test was used to differentiate between Fixed Effects and Random Effects Models. In this case, the p-value was less than 0.05, and the null hypothesis that the difference in coefficients is not systematic was rejected, and the test indicated that the Fixed Effects Model was the correct specification.

d. <u>Model 4</u>: Random-Effects Model **(**Europe**):**

Variable	***VIF***
Real Interest Rate	4.52
Trade Openness	4.20
CPI Inflation	4.20
Real Exchange Rate	4.00
Lagged CPI Inflation	3.92
IT x GC Dummy	2.73
IT Dummy	2.66
Domestic Absorption	2.04
Lagged Real GDP per Capita	1.82
Population Growth Rate	1.79
Global Crisis Dummy	1.75
Mean VIF	**3.06**

<u>Note:</u> The Hausman Test was used to differentiate between Fixed Effects and Random Effects Models. In this case, the p-value was greater than 0.05, and the null hypothesis that the difference in coefficients is not systematic could not be rejected, and the test indicated that the Random Effects Model was the correct specification.

e. **Model 5:** Fixed-Effects Model (Emerging Market Economies):

Variable	***VIF***
Real Interest Rate	3.80
Trade Openness	3.61
Domestic Absorption	3.38
CPI Inflation	2.87
IT Dummy	2.57
ITGC Dummy	2.40
Expected CPI Inflation	2.15
Global Crisis Dummy	2.09
Population Growth Rate	2.07
Real Exchange Rate	1.68
Lagged Real GDP per capita	1.55
Mean VIF	**2.56**

Note: The Hausman Test was used to differentiate between Fixed Effects and Random Effects Models. In this case, the p-value was less than 0.05, and the null hypothesis that the difference in coefficients is not systematic was rejected, and the test indicated that the Fixed Effects Model was the correct specification.

Table 5: Descriptive Statistics:

a. World Data Descriptive Statistics:

Variable	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Real GDP per Capita Growth Rate	480	3.29	8.08	-71.30	26.37
Lagged Real GDP per Capita Growth Rate	479	3.31	8.07	-71.30	26.37
CPI Inflation	480	50.31	285.16	-1.36	4734.91
Lagged CPI inflation	479	50.28	285.46	-1.36	4734.92
Real interest rate	307	7.04	15.88	-88.50	77.62
IT Dummy	480	0.35	0.48	0	1
Global Crises dummy	480	0.25	0.43	0	1
Real Exchange rate	460	4.49	0.21	3.64	5.12
Domestic Absorption	480	13.02	1.11	10.64	16.61
Trade openness	475	4.16	0.52	2.75	5.40
Population growth rate	479	0.86	1.05	-5.81	3.73
IT x GC Dummy	480	0.85	0.28	0	1

b. Asia Data Descriptive statistics:

Variable	*Observations*	*Mean*	*Standard Deviations*	*Min*	*Max*
Real GDP per Capita Growth Rate	168.00	3.93	8.60	-26.21	21.27
Lagged Real GDP per Capita Growth Rate	168.00	4.08	8.28	-25.76	21.27
CPI Inflation	168.00	27.59	161.41	-1.36	1877.37
Lagged CPI inflation	168.00	27.58	161.41	-1.36	1877.37
Real interest rate	111.00	3.52	5.75	-24.60	19.62
IT Dummy	168.00	0.20	0.40	0	1
Global Crises dummy	168.00	0.25	0.43	0	1
Real Exchange rate	159.00	4.54	0.18	3.85	4.88
Domestic Absorption	168.00	13.02	0.91	11.27	14.99
Trade openness	167.00	4.35	0.50	3.27	5.40
Population growth rate	168.00	1.03	0.96	-1.75	2.69
IT x GC Dummy	168.00	0.05	0.23	0	1

c. **Latin America Data Descriptive Statistics:**

Variable	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Real GDP per Capita Growth Rate	144.00	3.72	6.77	-14.68	26.37
Lagged Real GDP per Capita Growth Rate	143.00	3.78	6.78	-14.68	26.37
CPI Inflation	144.00	53.48	250.01	0.07	2075.89
Lagged CPI inflation	143.00	53.45	250.88	0.07	2075.89
Real interest rate	126.00	12.75	18.61	-35.31	77.62
IT Dummy	144.00	0.49	0.50	0	1
Global Crises dummy	144.00	0.25	0.43	0	1
Real Exchange rate	141.00	4.46	0.24	3.64	4.89
Domestic Absorption	144.00	13.54	1.37	11.28	16.61
Trade openness	144.00	3.86	0.55	2.75	5.13
Population growth rate	144.00	1.45	0.33	0.86	2.34
IT x GC Dummy	144.00	0.10	0.31	0	1

d. **Europe Data Descriptive Statistics:**

Variable	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Real GDP per Capita Growth Rate	120	2.29	9.59	-71.30	16.59
Lagged Real GDP per Capita Growth Rate	120	2.34	9.55	-71.30	16.59
CPI Inflation	120	88.76	461.30	-0.28	4734.91
Lagged CPI inflation	120	88.79	461.29	-0.28	4734.92
Real interest rate	46	0.64	22.43	-88.50	43.19
IT Dummy	120	0.32	0.47	0	1
Global Crises dummy	120	0.25	0.43	0	1
Real Exchange rate	115	4.48	0.21	3.72	5.12
Domestic Absorption	120	12.29	0.77	10.64	13.77
Trade openness	116	4.39	0.34	3.67	5.13
Population growth rate	119	-0.36	0.89	-5.81	3.73
IT x GC Dummy	120	0.08	0.28	0	1

e. Emerging Market Economies Data Descriptive Statistics:

Variable	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Real GDP per Capita Growth Rate	120	3.81	6.97	-22.42	18.45
Lagged Real GDP per Capita Growth Rate	119	3.18	9.81	-71.30	18.45
CPI Inflation	120	74.53	283.89	-1.36	2075.89
Lagged CPI inflation	119	75.09	285.03	-1.36	2075.89
Real interest rate	91	11.18	18.13	-26.72	77.62
IT Dummy	120	0.33	0.47	0	1
Global Crises dummy	120	0.25	0.43	0	1
Real Exchange rate	117	4.44	0.22	3.7196	4.80
Domestic Absorption	120	13.26	1.03	11.5538	14.99
Trade openness	120	3.80	0.43	2.7495	4.71
Population growth rate	120	0.58	0.92	-1.8307	2.50
IT x GC Dummy	120	0.08	0.28	0	1

Works Cited

Amira, Beldi, Djelassi Mouldi, and Mete Feridun. 2013. "Growth Effects of Inflation Targeting Revisited: Empirical Evidence from Emerging Markets." *Applied Economics Letters* 20 (6): 587-591.

Ayres, Kelly, Ariel R. Belasen, and Ali M. Kutan. 2014. "Does Inflation Targeting Lower Inflation and Spur Growth?" *Journal of Policy Modeling* 36 (2): 373-388.

Batini, Nicoletta and Douglas Laxton. 2006. *Under what Conditions can Inflation Targeting be Adopted?*. Documentos De Trabajo. Santiago de Chile.

Brito, R. and B. Bystedt. 2006. "the Macroeconomic Effects of Inflation Targeting in Latin America." *Ibmec Sao Paulo Working Papers.*

Brito, Ricardo D. and Brianne Bystedt. 2010. "Inflation Targeting in Emerging Economies: Panel Evidence." *Journal of Development Economics* 91 (2): 198-210.

Calvo, Guillermo A. and Frederic S. Mishkin. 2003. "The Mirage of Exchange Rate Regimes for Emerging Market Countries." *The Journal of Economic Perspectives* 17 (4): 99-118.

Carvalho Filho, Irineu E. 2011. "28 Months Later." *The B.E. Journal of Macroeconomics* 11 (1): 1-44.

Gonçalves, Carlos Eduardo S. and João M. Salles. 2008. "Inflation Targeting in Emerging Economies: What do the Data Say?" *Journal of Development Economics* 85 (1): 312-318.

Laurence Ball. 2011. "Inflation Dynamics and the Great Recession;" *Brookings Papers on Economic Activity* 2011 (1): 337-381.

Mishkin, F. S. 2000. "Inflation Targeting in Emerging-Market Countries." *The American Economic Review* 90 (2): 105-109.

Mishkin, Frederic S. 2004. *Can Inflation Targeting Work in Emerging Market Countries?*. National Bureau of Economic Research. Vol. 10646. Cambridge, Mass: National Bureau of Economic Research.

Mishkin F.S. 2008. "Challenges for Inflation Targeting in Emerging Market Countries." *Emerging Markets Finance and Trade* 44 (6): 5-16.

Mollick, André Varella, René Cabral, and Francisco G. Carneiro. 2011. "Does Inflation Targeting Matter for Output Growth? Evidence from Industrial and Emerging

Nazrul Islam. 1995. "Growth Empirics: A Panel Data Approach." *The Quarterly Journal of Economics* 110 (4): 1127-1170.

Öztürk, Serdar, Ali Sözdemir, and Özlem Ülger. 2014. "The Effects of Inflation Targeting Strategy on the Growing Performance of Developed and Developing Countries: Evaluation of Pre and Post Stages of Global Financial Crisis." *Procedia - Social and Behavioral Sciences* 109: 57-64.

Son, Hyun H. and Nanak Kakwani. 2008. "Global Estimates of Pro-Poor Growth." *World Development* 36 (6): 1048-1066.

Svensson, Lars E. O. 2007. "Optimal Inflation Targeting: Further Developments of Inflation Targeting." In *Monetary Policy Under Inflation Targeting*. 1st ed. Vol. 11, 187-225: Central Bank of Chile.

Svensson, Lars E. O. 2009. "Transparency Under Flexible Inflation Targeting." *Sveriges Riksbank Economic Review* (1): 5-44.